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फाउंड्री में उपयोग के लिए स्प्रिंग डॉवेल  
स्लीव्स (हलके और भारी पैटर्न) — विशिष्टि  
( पहला पुनरीक्षण )

Spring Dowel Sleeves (Light and  
Heavy Pattern) for Use in Foundries  
— Specification  
( First Revision )

ICS 21.060.50

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भारतीय मानक ब्यूरो  
BUREAU OF INDIAN STANDARDS  
मानक भवन, 9 बहादुर शाह ज़फर मार्ग, नई दिल्ली – 110002  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI – 110002  
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## FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Foundry and Steel Castings Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1970. This revision has been brought out to bring the standard in the latest style and format of the Indian Standards.

In addition, the following changes have been made:

- a) The scope of the standard is modified;
- b) Reference clause has been included;
- c) Figures were replaced to make them clearly visible;
- d) Table 1 and Table 2 were modified — The dimensions and tolerances specified in this standard are in line with the dimensions and tolerances in ISO 8752 : 2009 and ISO 13337 : 2009;
- e) Table 5 is included - The material grades are modified in line with ISO 8752 : 2009 and ISO 13337 : 2009;
- f) Hardness test is included in clause 5 “Technical Requirements and Tests”; and
- g) Marking and Packing clauses are modified.

Spring dowel sleeves are slotted pin made from spring steel material. They can also be manufactured from stainless steel material. Spring Dowel sleeve is accurately made to diameter greater than the drilled hole into which it is pressed. When inserted the elasticity of the material then exerting a continuous radial force over the full length of the pin. The purpose of the slot in the pins is to allow compression when inserted in the hole.

A Spring Dowel sleeves is the most economical, quick, simple and easy fastening system, which is particularly suitable for bulk production.

- a) It has shock and vibrating absorption capacity and can be removed and reutilize for maintenance;
- b) It causes no interlocking and exerts less radial pressure reducing component damage and trouble free working;
- c) It replaces rivets, bolts and washers, clevis pin and retaining ring as well as setscrew and other threaded components;
- d) No special skill are required as pins are easy to insert either by hand or by automated assembly and it can be carried out quite safely with unskilled labours;
- e) Nonstandard sleeves can also be manufactured to suit customer specific requirement; and
- f) It is used in countless application, in huge quantities and in widely ranging industries from automobile production to electronics.”

While drafting this Indian Standard assistance has been derived from the following international Standards:

- a) ISO 8752: 2009 ‘Spring-type straight pins — Slotted, heavy duty’; and
- b) ISO 13337: 2009 ‘Spring-type straight pins — Slotted, light duty’.

The composition of the committee responsible for the formulation of this standard is listed in Annex B.

For the purpose of deciding whether particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

*Indian Standard***SPECIFICATION FOR SPRING DOWEL SLEEVES (LIGHT AND HEAVY PATTERN) FOR USE IN FOUNDRIES***( First Revision )***1 SCOPE**

This Standard specifies the characteristics of slotted spring-type straight pins, made of steel or of austenitic or martensitic stainless steel, light and heavy pattern, with nominal diameter  $D_1$ , from 1 mm to 50 mm inclusive. Also used as spring dowel pins.

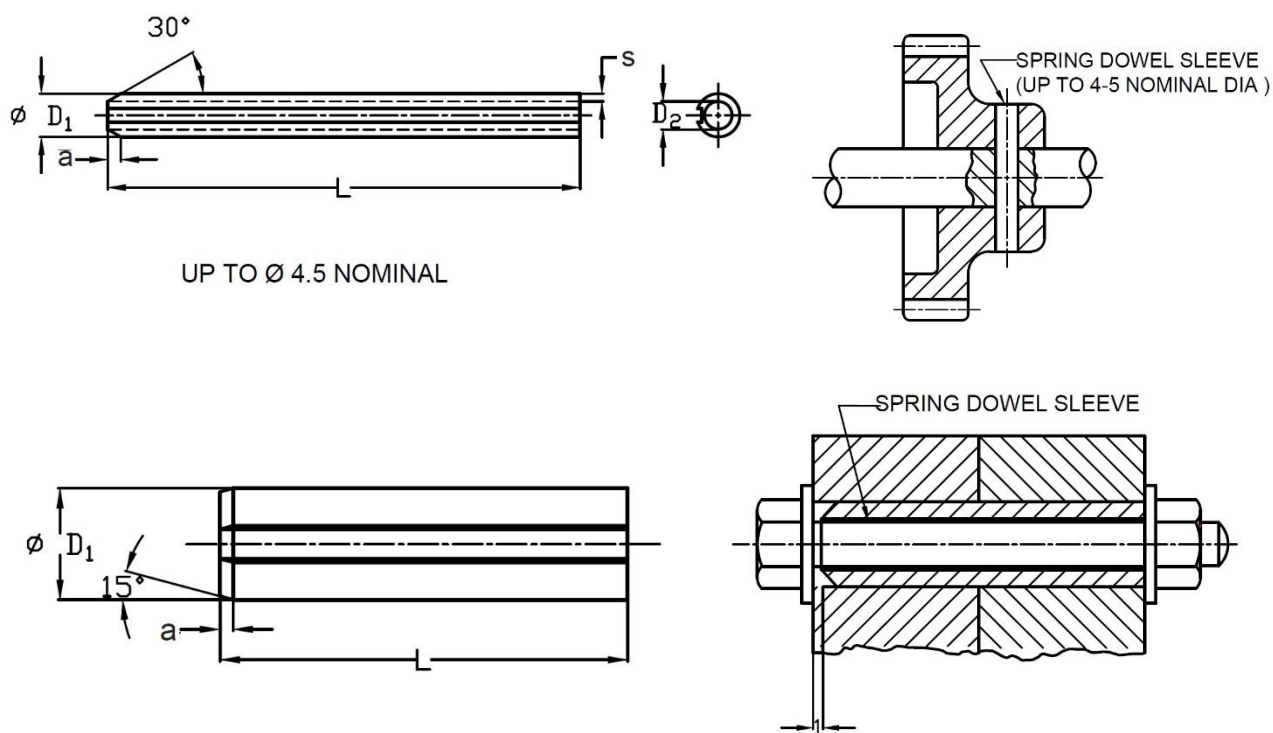
NOTE — The nominal diameters of heavy pattern have been chosen in such a way that pins can be fitted one into the other or combined with pins, light duty (vise versa).

**2 REFERENCE**

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

**3 DIMENSIONS AND TOLERANCES**

**3.1** As given in Tables 1 to Table 4 and in Fig. 1.



All dimensions in millimetres.

FIG. 1 SPRING DOWEL SLEEVES

**Table 1 Dimensions for Spring Dowel Sleeves (Light Pattern); All dimensions are in mm**  
(Clause 3.1)

| Sl No. | Nominal diameter<br>d1 | S<br>(Thickness of wall) | a<br>(Taper Size) | Tolerance on A | Before fitting |                 |      | For Bolt size<br>IS 14962 (Part 2) | Corresponding Washers<br>IS 2016 | Preferred length Range<br>(from up to and including) (L) |
|--------|------------------------|--------------------------|-------------------|----------------|----------------|-----------------|------|------------------------------------|----------------------------------|--|
|        |                        |                          |                   |                | D1             | Tolerance on D1 | D2   |                                    |                                  |  |
|        | mm                     | mm                       | mm                | mm             | mm             | mm              | mm   |                                    |                                  |  |
| (1)    | (2)                    | (3)                      | (4)               | (5)            | (6)            | (7)             | (8)  | (9)                                | (10)                             | (11)   |
| i)     | 2                      | 0.2                      | 0.2               | + 0.2          | 2.3            | + 0.1           | 1.9  | -                                  | -                                | 4 - 30   |
| ii)    | 2.5                    | 0.25                     | 0.25              |                | 2.8            |                 | 2.3  | -                                  | -                                | 4 - 30   |
| iii)   | 3                      | 0.3                      | 0.25              |                | 3.3            | + 0.2           | 2.7  | -                                  | -                                | 4 - 40   |
| iv)    | 3.5                    | 0.35                     | 0.3               |                | 3.8            |                 | 3.1  | -                                  | -                                | 4 - 40   |
| v)     | 4                      | 0.5                      | 0.5               |                | 4.4            |                 | 3.4  | -                                  | -                                | 4 - 50   |
| vi)    | 4.5                    | 0.5                      | 0.5               |                | 4.8            |                 | 3.8  | M3                                 | 3.2                              | 4 - 50   |
| vii)   | 5                      | 0.5                      | 0.5               |                | 5.4            |                 | 4.4  | -                                  | -                                | 5 - 80   |
| viii)  | 6                      | 0.75                     | 0.7               |                | 6.4            | + 0.3           | 4.9  | M4                                 | 4.3                              | 10 - 100   |
| ix)    | 8                      | 0.75                     | 1.5               | + 0.3          | 8.5            |                 | 7.0  | M6                                 | 6.4                              | 10 - 120   |
| x)     | 10                     | 1                        | 2                 | + 0.4          | 10.5           |                 | 8.5  | -                                  | -                                | 10 - 160   |
| xi)    | 12                     | 1                        | 2                 |                | 12.5           |                 | 10.5 | M8                                 | 8.4                              | 10 - 160   |
| xii)   | 13                     | 1.2                      | 2                 |                | 13.5           |                 | 11   | M10                                | 10.5                             | 10 - 180   |
| xiii)  | 14                     | 1.5                      | 2                 |                | 14.5           |                 | 11.5 | -                                  | -                                | 10 - 180   |
| xiv)   | 16                     | 1.5                      | 2                 |                | 16.5           |                 | 13.5 | M12                                | 13                               | 10 - 200   |
| xv)    | 18                     | 1.7                      | 2                 |                | 18.5           |                 | 15.0 | M14                                | 15                               | 10 - 200   |
| xvi)   | 20                     | 2.0                      | 2                 |                | 20.5           | + 0.4           | 16.5 | -                                  | -                                | 10 - 200   |
| xvii)  | 21                     | 2.0                      | 2                 |                | 21.5           |                 | 17.5 | M16                                | 17                               | 14 - 200   |
| xviii) | 25                     | 2.0                      | 3                 |                | 25.5           |                 | 21.5 | M20                                | 21                               | 14 - 200   |
| xix)   | 28                     | 2.5                      | 3                 |                | 28.5           |                 | 23.5 | M22                                | 23                               | 14 - 200   |
| xx)    | 30                     | 2.5                      | 3                 |                | 30.5           |                 | 25.5 | M24                                | 25                               | 14 - 200   |
| xxi)   | 35                     | 3.5                      | 3                 | + 0.6          | 35.5           |                 | 28.5 | M27                                | 28                               | 20 - 200   |
| xxii)  | 40                     | 4.0                      | 4                 |                | 40.5           |                 | 32.5 | M30                                | 31                               | 20 - 200   |
| xxiii) | 45                     | 4.0                      | 4                 |                | 45.5           |                 | 37.5 | M36                                | 37                               | 20 - 200   |
| xxiv)  | 50                     | 5.0                      | 4                 |                | 50.5           |                 | 40.5 | M39                                | 40                               | 20 - 200   |

Designation:

EXAMPLE 1 A spring dowel sleeve, light pattern, with nominal diameter  $d_1 = 6$  mm and nominal length  $l = 30$  mm, made of steel (St), is designated as follows:

**Spring Dowel Sleeve IS 5988 Light - 6 × 30-St**

EXAMPLE 2 A non-interlocking spring dowel sleeve (N), light pattern, with nominal diameter  $d_1 = 6$  mm and nominal length  $l = 30$  mm, made of martensitic stainless steel (C), is designated as follows:

**Spring Dowel Sleeve IS 5988 Light - 6 × 30-N-C**

Limits of sizes for commercial bolts and nuts (Diameter range 1 mm to 39 mm).

**Table 2 Dimensions for Spring Dowel Sleeves (Heavy Pattern); All dimensions are in mm**  
(Clause 3.1)

| Sl No.  | Nominal diameter d1 | S<br>(Thickness of wall) | a<br>(Taper Size) | Tolerance on a | Before fitting |                 |      | For Bolt size<br>IS 14962<br>(Part 2) | Corresponding Washers<br>IS 2016 | Preferred length Range<br>(from up to and including) (L) |
|---------|---------------------|--------------------------|-------------------|----------------|----------------|-----------------|------|---------------------------------------|----------------------------------|--|
|         |                     |                          |                   |                | D1             | Tolerance on D1 | D2   |                                       |                                  |  |
|         | mm                  | mm                       | mm                | mm             | mm             | mm              | mm   |                                       |                                  |  |
| (1)     | (2)                 | (3)                      | (4)               | (5)            | (6)            | (7)             | (8)  | (9)                                   | (10)                             | (11)   |
| i)      | 1                   | 0.2                      | 0.15              | + 0.2          | 1.2            | + 0.1           | 0.8  | -                                     | -                                | 4 - 20   |
| ii)     | 1.5                 | 0.3                      | 0.25              |                | 1.7            |                 | 1.1  | -                                     | -                                | 4 - 20   |
| iii)    | 2                   | 0.4                      | 0.35              |                | 2.3            |                 | 1.5  | -                                     | -                                | 4 - 30   |
| iv)     | 2.5                 | 0.5                      | 0.4               |                | 2.8            |                 | 1.8  | -                                     | -                                | 4 - 30   |
| v)      | 3                   | 0.6                      | 0.5               |                | 3.3            | + 0.2           | 2.1  | -                                     | -                                | 4 - 40   |
| vi)     | 3.5                 | 0.75                     | 0.6               |                | 3.8            |                 | 2.3  | -                                     | -                                | 4 - 40   |
| vii)    | 4                   | 0.8                      | 0.65              |                | 4.4            |                 | 2.8  | -                                     | -                                | 4 - 50   |
| viii)   | 4.5                 | 1                        | 0.8               |                | 4.9            |                 | 2.9  | -                                     | -                                | 5 - 50   |
| ix)     | 5                   | 1                        | 0.9               |                | 5.4            |                 | 3.4  | -                                     | -                                | 5 - 80   |
| x)      | 6                   | 1.25                     | 1.2               |                | 6.4            | + 0.3           | 3.9  | M3                                    | 3.2                              | 10 - 100   |
| xi)     | 8                   | 1.5                      | 1.6               | + 0.4          | 8.5            |                 | 5.5  | M4                                    | 4.3                              | 10 - 120   |
| xii)    | 10                  | 2                        | 2                 |                | 10.5           |                 | 6.5  | M5                                    | 5.3                              | 10 - 160   |
| xiii)   | 12                  | 2.5                      | 2                 |                | 12.5           |                 | 7.5  | M6                                    | 6.4                              | 10 - 180   |
| xiv)    | 13                  | 2.5                      | 2                 |                | 13.5           |                 | 8.5  | -                                     | -                                | 10 - 180   |
| xv)     | 14                  | 3                        | 2                 |                | 14.5           |                 | 8.5  | -                                     | -                                | 10 - 200   |
| xvi)    | 16                  | 3                        | 2                 |                | 16.5           |                 | 10.5 | M8                                    | 8.4                              | 10 - 200   |
| xvii)   | 18                  | 3.5                      | 2                 |                | 18.5           | + 0.4           | 11.5 | M10                                   | 10.5                             | 10 - 200   |
| xviii)  | 20                  | 4                        | 3                 |                | 20.5           |                 | 12.5 | -                                     | -                                | 10 - 200   |
| xix)    | 21                  | 4                        | 3                 |                | 21.5           |                 | 13.5 | M12                                   | 13                               | 14 - 200   |
| xx)     | 25                  | 5                        | 3                 |                | 25.5           |                 | 15.5 | M14                                   | 15                               | 14 - 200   |
| xxi)    | 28                  | 5.5                      | 3                 |                | 28.5           |                 | 17.5 | M16                                   | 17                               | 14 - 200   |
| xxii)   | 30                  | 6                        | 3                 | + 0.6          | 30.5           |                 | 18.5 | -                                     | -                                | 14 - 200   |
| xxiii)  | 32                  | 6                        | 3                 |                | 32.5           |                 | 20.5 | M18                                   | 19                               | 20 - 200   |
| xxiv)   | 35                  | 7                        | 3                 |                | 35.5           |                 | 21.5 | M20                                   | 21                               | 20 - 200   |
| xxv)    | 38                  | 7.5                      | 4                 |                | 38.5           |                 | 23.5 | M22                                   | 23                               | 20 - 200   |
| xxvi)   | 40                  | 7.5                      | 4                 |                | 40.5           |                 | 25.5 | M24                                   | 25                               | 20 - 200   |
| xxvii)  | 45                  | 8.5                      | 4                 |                | 45.5           |                 | 28.5 | M27                                   | 28                               | 20 - 200   |
| xxviii) | 50                  | 9.5                      | 4                 |                | 50.5           |                 | 31.5 | M30                                   | 31                               | 20 - 200   |

Designation:

EXAMPLE 1 A spring dowel sleeve, heavy pattern, with nominal diameter  $d_1 = 6$  mm and nominal length  $l = 30$  mm, made of steel (St), is designated as follows:

**Spring Dowel Sleeve IS 5988 Heavy - 6 × 30-St**

EXAMPLE 2 A non-interlocking spring dowel sleeve (N), heavy pattern, with nominal diameter  $d_1 = 6$  mm and nominal length  $l = 30$  mm, made of martensitic stainless steel (C), is designated as follows:

**Spring Dowel Sleeve IS 5988 Heavy - 6 × 30-N-C**

**Table 3 Preferred Lengths**  
(Clause 3.1)

| <b>Sl No.</b> | <b>Length<br/>mm</b> | <b>In steps of<br/>mm</b> |
|---------------|----------------------|---------------------------|
| (1)           | (2)                  | (3)                       |
| i)            | 4 to 6               | 1                         |
| ii)           | 6 to 32              | 2                         |
| iii)          | 32 to 40             | 4                         |
| iv)           | 40 to 100            | 5                         |
| v)            | 100 to 200           | 20                        |

**Table 4 Tolerances on Lengths**  
(Clause 3.1)

| <b>Sl No.</b> | <b>Length<br/>mm</b> | <b>Tolerance<br/>mm</b> |
|---------------|----------------------|-------------------------|
| (1)           | (2)                  | (3)                     |
| i)            | 4 to 10              | + 0.5                   |
| ii)           | 11 to 50             | + 1.0                   |
| iii)          | 51 to 200            | + 1.5                   |



#### 4 TOLERANCE

**4.1** The nominal diameter of sleeve is also the nominal diameter of the receiving bore. Tolerance on receiving bore shall be H12 of IS 919 (Part 2).

**4.2** The width of longitudinal gap in the sleeve shall be not less than the difference between dimension  $D_l$  and nominal diameter of the sleeve with a maximum tolerance equal to the tolerance on

dimension  $D_l$ . This gap size is applicable when the sleeve is not inserted.

#### 5 MATERIAL

**5.1** The composition of the material shall be as given in Table 5. The chemical analysis of the materials used shall be determined by any established chemical/instrumental method:

**Table 5 Grades and chemical composition Requirements**  
(Clause 5.1)

| Sl No.   |          | Steel  | Austenitic<br>Stainless steel  | Martensitic<br>Stainless steel   |
|--|----------|--|--|--|
|  |          | St   | A  | C  |
|  |          | Chemical composition limits<br>(check analysis) %  |  |  |
| (1)  | (2)      | (3)  | (4)  |  |
| i)   | Material | <p>Steel (St) at the supplier's discretion, either:</p> <p>Plain carbon steel with<br/>C <math>\geq 0.65</math> %<br/>Mn <math>\geq 0.60</math> % (0.5 % incase of heavy duty)<br/>(check analysis)<br/>Hardened and tempered to a Vickers<br/>Hardness of 420 HV to 520 HV or austempered to a Vickers hardness of 500 HV to 560 HV.</p> <p>OR</p> <p>Silicon manganese steel with<br/>C <math>\geq 0.5</math> %<br/>Si <math>\geq 1.5</math> %<br/>Mn <math>\geq 0.7</math> %<br/>(check analysis)<br/>Hardened and tempered to a Vickers hardness of 420 HV to 560 HV as given in <b>6.5</b>.</p> | <p>C <math>\leq 0.15</math><br/>Mn <math>\leq 2.00</math><br/>Si <math>\leq 1.50</math><br/>Cr 16 to 20<br/>N 6 to 12<br/>P <math>\leq 0.045</math><br/>S <math>\leq 0.03</math><br/>Mo <math>\leq 0.8</math></p> <p>Cold worked</p> | <p>C <math>\leq 0.15</math><br/>Mn <math>\leq 1.00</math><br/>Si <math>\leq 1.00</math><br/>Cr 11.5 to 14<br/>Ni <math>\leq 1.00</math><br/>P <math>\leq 0.04</math><br/>S <math>\leq 0.03</math></p> <p>Hardened and tempered to a Vickers hardness of 440 HV to 560 HV as given in <b>6.5</b>.</p> |
| NOTE — For other materials, as agreed between the customer and supplier. |          |  |  |  |

5.2 Form and width of slot at the discretion of the supplier. Non-interlocking pins with a form and/or width of slot which guarantees no interlocking may be supplied by special agreement between the customer and supplier.

where

$$\text{Slot} = \frac{\text{Normal case}}{\text{Type N}}$$

## 6 TECHNICAL REQUIREMENTS AND TESTS

### 6.1 Surface finish

Plain, that is pins to be supplied in natural finish, treated with a protective lubricant. Unless otherwise specified by agreement between the customer and the supplier. If pins are surface coated, appropriate plating or coating processes should be employed to avoid hydrogen embrittlement. Due to the risk of hydrogen embrittlement. Pins should not be electroplated or phosphate-coated. If electroplating or phosphate coating is required for corrosion prevention. By agreement between the customer and the supplier. It is mandatory that the pins be baked immediately after plating to minimize the risk of hydrogen embrittlement. Nevertheless, freedom from hydrogen embrittlement is not absolutely guaranteed. All tolerances shall apply prior to the application of a plating or coating.

### 6.2 Workmanship

The surface of spring dowel sleeves shall be smooth and free from scale and burr. The outer edges along the slit and around the ends shall normally be deburred, but alternatively may be slightly rounded.

### 6.3 Shear Strength

Shear strength shall not be less than 0.45 times the tensile strength. Test method shall be in accordance with IS 5242, but with shearing edges of 700 HV, *Min.*

### 6.4 Resilience and Recovery Test

Resilience and recovery shall be tested by driving the sleeve ten times through a hole of nominal size, within the tolerance zone H6 in a hardened steel plate of St 60. The maximum reduction in the oversize on the diameter shall not exceed 50 percent

of the oversize in delivery condition, for example, the outside diameter shall not be less than 10.25 mm on reduction from 10.5 mm for a spring dowel sleeve of 10 mm nominal diameter.

### 6.5 Hardness test

Hardness testing of the material shall be in accordance with IS 1501 (Part 1).

## 7 SAMPLING

Sampling of Spring Dowel Sleeves shall be in accordance with IS 1367 (Part 17) "Industrial Fasteners - Threaded steel fasteners - Technical supply conditions, Inspection, sampling and acceptance procedure".

## 8 OILING

A thin film of rust preventive oil shall be applied.

## 9 PACKING

9.1 Packed in water proof paper and placed in cartons or wooden boxes in bundles of 10, 25 or 50.

9.2 Packets may be placed in wooden boxes weighing not more than 50 kg overall.

9.3 Packets shall bear the information described under 11.1, and also the number of pieces.

## 10 GENERAL CONDITIONS OF DELIVERY

General requirements relating to the supply of Spring Dowel Sleeves shall be as laid down in IS 1387.

## 11 MARKING

11.1 The sleeves shall be suitably marked with the following information:

- a) Designation;
- b) Trade-mark or name of the manufacturer;
- c) Quantity; and
- d) Any other information, if required.

### 11.2 BIS Certification Marking

The products (s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provision of the *Bureau of Indian standards Act, 2016* and the Rules and Regulations framed thereunder, and the product may be marked with the Standard Mark.

**ANNEX A**  
(Clause 2)  
**LIST OF REFERRED STANDARDS**

| <i>IS No</i>                                    | <i>Title</i>  | <i>IS No</i>                                    | <i>Title</i>   |
|---|---|---|--|
| IS 1367 (Part 17) :<br>2005/ISO 3269 :<br>2000  | Technical supply conditions for threaded steel fasteners: Part 17 Inspections, sampling and acceptance procedure ( <i>fourth revision</i> ) | IS 2016 : 1967                                  | Specification for plain washers ( <i>first revision</i> )  |
| IS 1387 : 1993                                  | General requirements for the supply of metallurgical materials ( <i>second revision</i> )   | IS 5242 : 1979                                  | Method of test for determining shear strength of metals ( <i>first revision</i> )  |
| IS 1501 (Part 1) :<br>2020/ISO 6507-1 :<br>2018 | Method for vickers hardness test for metallic materials   | IS 14962 (Part 2) :<br>2001/ISO 965-2 :<br>1998 | ISO general purpose metric screw threads — Tolerances: Part 2 Limits of sizes for general purpose external and internal screw threads — Medium quality |

**ANNEX B**  
(Foreword)

**COMMITTEE COMPOSITION**

Foundry and Steel Castings Sectional Committee, MTD 14

| <i>Organization</i>  | <i>Representative(s)</i>  |
|--|---|
| BHEL (CFFP), Haridwar  | SHRI V. K. RAIZADA ( <b>Chairperson</b> )                             |
| BHEL, Haridwar   | SHRI A. N. SUDHAKAR<br>SHRI RANJITH LAKRA ( <i>Alternate</i> )        |
| Bharat Heavy Electricals Ltd, HPEP, Hyderabad  | SHRI ABHINAV AGRAWAL  |
| Bhilai Engineering Corporation Limited, Bhilai   | SHRI AKHIL DUBEY<br>SHRI SHIV DUTT MISHRA ( <i>Alternate</i> )        |
| CSIR – National Institute for Interdisciplinary Science and Technology (NIIST), Thiruvananthapuram | DR TPD RAJAN<br>DR M. RAVI ( <i>Alternate</i> )                       |
| CSIR-Central Mechanical Engineering Research Institute, Durgapur                                   | DR. SUDIP SAMANTHA  |
| Disa India Ltd, Bangalore  | SHRI SUNIL KUMAR GHOSH<br>SHRI SURESH KUMAR A. ( <i>Alternate</i> )   |
| Directorate General of Quality Assurance   | SHRI ASHOK KUMAR<br>SHRI S. ROY CHOWDHURY ( <i>Alternate</i> )        |
| Forace Polymers Private Limited, Haridwar  | SHRI D. K. GHOSH  |
| Hindustan Aeronautics, Foundry and Forge Division, Bengaluru                                       | SHRI K. SATYENDRA KUMAR   |
| Indian Register of Shipping, New Delhi   | DR K. K. DHAWAN<br>SHRI S. VELMURUGAN ( <i>Alternate</i> )            |
| Indian institute of Technology, Kharagpur  | PROF SHIV BRAT SINGH<br>PROF DEBALAY CHAKRABARTI ( <i>Alternate</i> ) |
| Institute of Technology (BHU), Varanasi  | DR INDRAJIT CHAKRABARTY<br>DR JAYANT KUMAR SINGH ( <i>Alternate</i> ) |
| Indian Ordnance Factory, Grey Iron Foundry, Jabalpur   | SHRI M. P. YADAV<br>SHRI ARUNANSHU PRAMANIK ( <i>Alternate</i> )      |
| Indian Ordnance Factory Board, Kolkata   | SHRI G. JHA<br>SHRI A. K. LALA ( <i>Alternate</i> )                   |
| Leader Valves Ltd., Jalandhar  | SHRIMATI PURNIMA BERI<br>SHRI SARABJIT SINGH ( <i>Alternate</i> )     |
| Ministry of Defence (DGQA), Ichapur  | SHRI ASHOK KUMAR<br>SHRI RUPESH BANAIT ( <i>Alternate</i> )           |
| Ministry of Railway, RDSO, Lucknow   | SHRI C. SENGUPTA<br>SHRI RAJ KISHORE PRASAD ( <i>Alternate</i> )      |
| Ministry of Science & Technology, New Delhi  | MS TAMANNA ARORA<br>SHRI K. S. P. RAO ( <i>Alternate</i> )            |
| National Institute of Foundry & Forging Technology, Ranchi   | DR KAMLESH KUMAR SINGH<br>DR AMITESH KUMAR ( <i>Alternate</i> )       |
| National Metallurgical Laboratory, Jamshedpur  | DR D. N. PASWAN<br>MS MINAL SHAH ( <i>Alternate</i> )                 |

| <i>Organization</i>                            | <i>Representative(s)</i>   |
|--|--|
| NIT Manipur, Langol, Imphal                    | PROF (DR) GOUTAM SUTRADHAR<br>DR ANIL KUMAR BIRRU ( <i>Alternate I</i> )<br>DR SABINDRA KACHHAP ( <i>Alternate II</i> )                          |
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